AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

LISTING OF CLAIMS:

1. (Currently Amended) A print control unit comprising:

a position detecting part to detect a position and a transfer direction of an object to be controlled and driven by a motor;

a speed detecting part to detect at least a physical value that corresponds to a speed of the object;

a first control part to decide a current value to be supplied to the motor so that the speed of the object reaches a target speed, based on the output of the position detecting part and at least one of control parameters, thus controlling the motor based on the current value decided by the first control part;

a second control part to decide a ~~a~~ the current value to be supplied to the motor so that the speed of the object reaches the target speed, based on the outputs of the position detecting part and the speed detecting part, and at least one of the control parameters, thus controlling the motor based on the current value decided by the second control part;

a third control part to decide a ~~a~~ the current value to be supplied to the motor so that the object stops within a predetermined range, based on the output of the position detecting part and at least one of the control parameters, thus controlling the motor based on the decided current value; and

a selection control part, operating at a predetermined timing, to select and set the control

parameters in accordance with the target speed, to judge as to whether the object is located

within a target range, based on the output of the position detecting part, if located, the selection

control part selecting and operating the third control part, while if the object is not located within

the target range, the selection control part selecting and operating the first or the second control

part based on the physical value corresponding to the speed.

2. (Original) A print control unit, as set forth in claim 1, further comprising a differential

speed control part, operating when the first or the second control part is selected, to calculate

speeds of the object based on the output of the speed detecting part for obtaining speed

deviations of the speeds of the object at operations from a reference speed, to calculate a current

value that is proportional to the difference between the speed deviation at the present operation

and the speed deviation at a previous operation, thus controlling the motor based on addition of

the calculated current value and the output of the selected control part.

3. (Currently Amended) A print control unit, as set forth in claim 1, wherein the object

to be controlled is a carriage, the motor is a carriage motor for driving the carriage, and the

position detecting part ~~includes~~comprises -a counter that detects leading and trailing edges of

output pulses of an encoder that generates the pulses according to rotation of the carriage motor,

counts up the detected edges when the carriage motor is rotating in a normal direction, while

counts down the detected edges when the carriage motor is rotating in the reverse direction, the

position detecting part generating pulses in synchronism with the leading and trailing edges.

4. (Currently Amended) A print control unit, as set forth in claim 3, wherein the

selection control part comprises ~~includes~~ a timer counter, having a set value in accordance with

the target speed of the carriage, whose counted value is reset when the counted value reaches the

set value or when the timer counter receives the pulses from the position detecting part, and,

when the carriage is not located within the target range, the selection control part selects the first

control part when receiving no pulses from the position detecting part even <u>when</u> the counted

value of the timer counter has reached the set value, while selects the second control part when

receiving the pulses from the position detecting part before the counted value of the timer

counter reaches the set value.

5. (Original) A print control unit, as set forth in claim 4, wherein when the first control

part is selected by the selection control part, and when the position of the carriage is not located

beyond the target position, the first control part adds an incremental or a decremental current

value selected among the control parameters according to the target speed to a current value that

is now being supplied to the carriage motor, thus controlling the carriage motor based on the

addition result, when the position of the carriage is located beyond the target position and also

the target range, the first control part subtracts the incremental or the decremental current value

from the current value that is now being supplied to the carriage motor, thus controlling the

carriage motor based on the subtraction result, and when the position of the carriage is located

within the target range, the first control part subtracts a current value corresponding to friction

load that is one of the control parameters from the current value being supplied to the carriage

motor in a direction that is the reverse of a direction in which a current value is supplied to the

carriage motor while the carriage is moving, thus controlling the carriage motor based on the

subtraction result.

6. (Original) A print control unit, as set forth in claim 4, wherein when the second

control part is selected by the selection control part, or when the position of the carriage is not

located beyond the target position or the position of the carriage is located beyond the target

position and the target range, the second control part compares the output of the speed detecting

part and a threshold value among the control parameters to select an incremental or a

decremental current value among the control parameters, to calculate a current value to be

supplied to the carriage motor so that the speed of the carriage reaches the target speed based on

the selected incremental or decremental current value and a current value that is now being

supplied to the carriage motor, thus controlling the carriage motor based on the calculated

current value, while when the position of the carriage is located within the target range, the

second control part subtracts a current value corresponding to friction load from the current value

supplied to the carriage motor in a direction that is the reverse of a direction in which a current

value is being supplied to the carriage motor while the carriage is moving.

7. (Currently Amended) A print control unit, as set forth in claim 6, wherein the speed

detecting part comprises ~~includes~~ a time measuring part that detects the leading and trailing

edges of the output pulses of the encoder and measures a period between the edges, the speed

detecting part outputting the measuring result.

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8. (Currently Amended) A print control unit, as set forth in claim 7, further ~~including~~comprising ~~a~~ differential speed control part, operating while the first or the second control part has been selected, to calculate speeds of the object based on the output of the speed detecting part to obtain speed deviations of the speeds of the object at operations from a reference speed, to calculate a current value that is proportional to the difference between the speed deviation at the present operation and the speed deviation at a previous operation, thus controlling the motor based on addition of the calculated current value and the output of the selected control part.

9. (Original) A print control unit, as set forth in claim 4, wherein when the third control part is selected by the selection control part, the third control part judges as to whether the position of the carriage is located within a predetermined allowable range including the target range, if located, to set the current value to be supplied to the carriage motor at zero for controlling the carriage motor, while if not located within the allowable range, to operate the first or the second control part via the selection control part.

10. (Original) A print control unit, as set forth in claim 3, wherein when an absolute value of the current value to be supplied to the carriage motor exceeds an allowable value, the carriage is stopped for short brake operation of the carriage motor.

11. (Original) A print control unit, as set forth in claim 3, wherein, based on the output

of the position detecting part, while the carriage is approaching a predetermined position towards

the target range, the predetermined position being located outside the target range and being

apart from one of terminals of the target range by a predetermined distance, the selection control

part selects and sets at least one of the control parameters so that the target speed of the carriage

reaches a first value, and when the carriage passes the predetermined position, the selection

control part selects and sets at least one of the control parameters so that the target speed reaches

a second value that is smaller than the first value.

12. (Currently Amended) A print control method used for a print control unit

~~including~~comprising -a position counter having a counter that detects leading and trailing edges

of output pulses of an encoder that is transferred with a carriage driven by a carriage motor, and

counts up the detected edges while the carriage motor is rotating in a normal direction, ~~on the~~

~~other hand,~~ and counts down the detected edges while the carriage motor is rotating in a reverse

direction, thus the position counter generating pulses in synchronism with the leading and

trailing edges; a period counter to detect the leading and trailing edges of the output pulses of the

encoder, and measure a period between the edges; and a timer counter having a set value

corresponding to ~~the~~ a̲ target speed of the carriage, a counted value of the timer counter being

reset when the counted value has reached ~~a~~ the̲ set value or when the timer counter receives the

pulses from the position counter, the method comprising ~~the steps of~~:

supplying an initial current value to the carriage motor;

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comparing the counted value of the position counter and ~~the~~ a target position of the

carriage when the timer counter receives the pulses from the position counter or when the

counted value of the timer counter reaches the set value;

performing hold control so that the carriage is stopped within an allowable range

~~including~~comprising a target range based on the output of the position counter and at least one

of control parameters when the position of the carriage is located within the target range

~~including~~comprising the target position;

performing timer interruption control so that a speed of the carriage reaches the target

speed based on the output of the position counter and the control parameter when the position of

the carriage is not located within the target range and when the timer counter receives no pulses

from the position counter even when the counted value of the timer counter has reached the set

value; and

performing encoder interruption control so that the speed of the carriage reaches the

target speed based on the outputs of the position counter and the period counter and also the

control parameter when the position of the carriage is not located within the target range and

when the timer counter receives pulses from the position counter until the counted value of the

timer counter reaches the set value.

13. (Currently Amended) A print control method, as set forth in claim 12, wherein the

~~step of~~ performing timer interruption control ~~includes the steps of~~comprises:

when the position of the carriage is not located beyond the target position, adding an

incremental or a decremental current value selected among the control parameters based on the

target speed, to a current value that is now being supplied to the carriage motor, thus controlling

the carriage motor based on the addition result;

when the position of the carriage is located beyond the target position and the target

range, subtracting the incremental or decremental current value from the current value that is

now being supplied to the carriage motor, thus controlling the carriage motor based on the

subtraction result; and

when the position of the carriage is located within the target range, subtracting a current

value corresponding to friction load that is one of the control parameters from the current value

supplied to the carriage motor in a direction that is the reverse of a direction in which a current

value is supplied to the carriage motor while the carriage is moving, thus controlling the carriage

motor based on the subtraction result.

14. (Currently Amended) A print control method, as set forth in claim 12, wherein the

~~step of~~ performing encoder interruption control ~~includes the steps of~~ comprises:

when the position of the carriage is not located beyond the target position or the position

of the carriage is located beyond the target position and the target range, comparing output of the

period counter and a threshold value among the control parameters to select an incremental or a

decremental current value among the control parameters based on the comparison result, to

calculate a current value to be supplied to the carriage motor so that the speed of the carriage

reaches the target speed based on the selected incremental or decremental current value and the

current value that is now being supplied to the carriage motor, thus controlling the carriage motor

based on the calculated current value; and

when the position of the carriage is located within the target range, subtracting a current

value corresponding to friction load from the current value supplied to the carriage motor in a

direction that is the reverse of a direction in which a current value is supplied to the carriage

motor while the carriage is moving, thus controlling the carriage motor based on the subtraction

result.

15. (Currently Amended) A print control method, as set forth in claim 12, wherein the

step of performing hold control includes the step of comprises judging as to whether the position

of the carriage is located in a predetermined allowable range comprising including the target

range, if located, to set the current value to be supplied to the carriage motor at zero for

controlling the carriage motor, while if not located, to perform the timer interruption control or

the encoder interruption control.

16. (Currently Amended) A computer-readable storage medium storing control program

code for controlling a print control unit, comprising:

first program code means for supplying an initial current value to a carriage motor for

driving a carriage;

second program code means for comparing a counted value of a position counter and a

target position of the carriage when a timer counter receives pulses from the position counter or

when the counted value of the timer counter reaches the a set value;

third program, code means for performing hold control so that the carriage is stopped

within an allowable range comprising including a target range based on the output of the position

counter and at least one of control parameters when the position of the carriage is located within

the target range comprising~~including~~ the target position;

fourth program code means for performing timer interruption control so that a speed of

the carriage reaches ~~the~~ a target speed based on the output of the position counter and the control

parameter when the position of the carriage is not located within the target range and when the

timer counter receives no pulses from the position counter even when the counted value of the

timer counter has reached the set value; and

fifth program code means for performing encoder interruption control so that the speed of

the carriage reaches the target speed based on the outputs of the position counter and the period

counter and also the control parameter when the position of the carriage is not located within the

target range and when the timer counter receives pulses from the position counter until the

counted value of the timer counter reaches the set value.

17. (New) A print control unit comprising:

a position detecting part to detect a position and a transfer direction of an object to be

controlled and driven by a motor;

a speed detecting part to detect at least a physical value that corresponds to a speed of the

object;

a first control part to decide an input value to be supplied to the motor so that the speed of

the object reaches a target speed, based on the output of the position detecting part, thus

controlling the motor based on the input value decided by the first control part;

a second control part to decide the input value to be supplied to the motor so that the

speed of the object reaches the target speed, based on the outputs of the position detecting part

and the speed detecting part, thus controlling the motor based on the input value decided by the

second control part;

a third control part to decide the input value to be supplied to the motor so that the object

stops within a predetermined range, based on the output of the position detecting part, thus

controlling the motor based on the decided input value; and

a selection control part, operating at a predetermined timing, to judge as to whether the

object is located within a target range, based on the output of the position detecting part, if

located, the selection control part selecting and operating the third control part, while if the

object is not located within the target range, the selection control part selecting and operating the

first or the second control part based on the physical value corresponding to the speed.

18. (New) A print control method used for a print control unit comprising a position

counter having a counter that detects leading and trailing edges of output pulses of an encoder

that is transferred with a carriage driven by a carriage motor, and counts up the detected edges

while the carriage motor is rotating in a normal direction, and counts down the detected edges

while the carriage motor is rotating in a reverse direction, thus the position counter generating

pulses in synchronism with the leading and trailing edges; a period counter to detect the leading

and trailing edges of the output pulses of the encoder, and measure a period between the edges;

and a tinier counter having a set value corresponding to a target speed of the carriage, a counted

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value of the timer counter being reset when the counted value has reached the set value or when

the timer counter receives the pulses from the position counter, the method comprising:

supplying an initial input value to the carriage motor;

comparing the counted value of the position counter and a target position of the carriage

when the timer counter receives the pulses from the position counter or when the counted value

of the timer counter reaches the set value;

performing hold control so that the carriage is stopped within an allowable range

comprising a target range based on the output of the position counter when the position of the

carriage is located within the target range comprising the target position;

performing timer interruption control so that a speed of the carriage reaches the target

speed based on the output of the position counter parameter when the position of the carriage is

not located within the target range and when the timer counter receives no pulses from the

position counter even when the counted value of the timer counter has reached the set value; and

performing encoder interruption control so that the speed of the carriage reaches the

target speed based on the outputs of the position counter and the period counter when the

position of the carriage is not located within the target range and when the timer counter receives

pulses from the position counter until the counted value of the timer counter reaches the set

value.

19. (New) A computer-readable storage medium storing control program code for

controlling a print control unit, comprising:

first program code means for supplying an initial input value to a carriage motor for

driving a carriage;

second program code means for comparing a counted value of a position counter and a

target position of the carriage when a timer counter receives pulses from the position counter or

when the counted value of the timer counter reaches a set value;

third program code means for performing hold control so that the carriage is stopped

within an allowable range comprising a target range based on the output of the position counter

when the position of the carriage is located within the target range comprising the target position;

fourth program code means for performing timer interruption control so that a speed of

the carriage reaches a target speed based on the output of the position counter when the position

of the carriage is not located within the target range and when the timer counter receives no

pulses from the position counter even when the counted value of the timer counter has reached

the set value; and

fifth program code means for performing encoder interruption control so that the speed of

the carriage reaches the target speed based on the outputs of the position counter and the period

counter when the position of the carriage is not located within the target range and when the

timer counter receives pulses from the position counter until the counted value of the timer

counter reaches the set value.